2021 DOE Vehicle Technologies Office Annual Merit Review Presentation

RURAL OPEN ACCESS DEVELOPMENT MOBILITY ACTION PLAN (R.O.A.D.M.A.P.)

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Rural Action
Thriving Communities, Healthy Environments

This presentation does not contain any proprietary, confidential, or otherwise restricted information.

Project ID # ti114

Overview

Timeline

Three Budget Periods
- **BP1:** 10/01/2019 – 3/31/2021
- **BP2:** 4/1/2021 – 3/31/2022
- **BP3:** 4/1/2022 – 3/31/2023

Project is **48% Complete**

Barriers and Technical Targets

1. Rural communities have disproportionate mobility gaps.

2. Rural advanced vehicle adoption lags behind urban areas.

3. Rural infrastructure readiness for these technologies is insufficient or unknown.

Budget

Total Project Funding
$1,782,603

DOE share: $880,724
Contractor share: $901,879
BP 1 Federal:$301,289
BP 1 Cost Share:$406,073
BP 2 Federal: $394,714
BP 2 Cost Share:$344,116
Total Expended to date: $794,479

Partners

Principal Investigator: Rural Action, Inc.

Major Technical and Constituent Partners
- Clean Fuels Ohio (CFO)
- Hocking-Athens-Perry Community Action (HAPCAP)
- Transportation Research Center, Inc. (TRC)
- Ohio Department of Transportation/DriveOhio
- Clean Cities Coalitions (KY, VA, WV, PA)
- National Renewable Energy Laboratory (NREL)

Project Objectives

Objectives

The objective of this project is to develop, demonstrate, and refine affordable, accessible, sustainable, and replicable mobility service-enabled electric vehicle shuttle service applications in rural Appalachian Ohio, supported by data collection, analysis, sharing, and public dissemination of results.

FY2020 and FY2021 contain development, demonstration, and data collection activities, with some limited analysis and sharing.

Tech Integration Goals

Economic Growth
Evaluate strategies for electric and automated (EV/AV) rural passenger vehicle adoption.

Affordability
Collect best practices for successful EV/AV fleet operation.

Reliability/Resiliency
Assess and promote rural infrastructure preparedness for EV/AV.

Impact

- Partner organizations gain library of EV/AV demonstration results to share with constituents.
- EV/AV adoption bottlenecks and solutions are clearly identified for rural stakeholders.
- Rural fleet managers gain confidence and capacity to deploy EV/AV passenger vehicles.
- Insight into rural EV/AV consumer behavior is leveraged into educational materials and campaigns.

Project Approach

Five Tasks: **Task 1:** Individual Motorist Data; **Task 2:** EV Shuttle Pilot; **Task 3:** Transportation Service Provider (TSP) Analysis and Education Program; **Task 4:** Automated Vehicle (AV) Feasibility Study; **Task 5:** Outreach

Budget Period 1: **Project Development**

- **Task 1**: Ohio Bureau of Motor Vehicles EV data collection
- **Task 2**: Transit baseline data collection
- **Task 3**: Local fleet analysis, educational activities
- **Task 4**: Early AV testing and deployment
- **Task 5**: Project Advisory Committee (PAC) formation

Budget Period 2: **Pilot Demonstration**

- **Task 1**: Rural Electrification Report
- **Task 2**: Shuttle Purchase and Deployment
- **Task 3**: Continued analysis and education
- **Task 4**: Additional AV deployments
- **Task 5**: Quarterly PAC meetings, outreach event

Budget Period 3: **Analysis and Dissemination**

- Deployments conclude
- All data analysis completed
- Final datasets in NREL possession
- Mobility Action Plan written and submitted

Milestones

FY2021 (BP1/BP2)

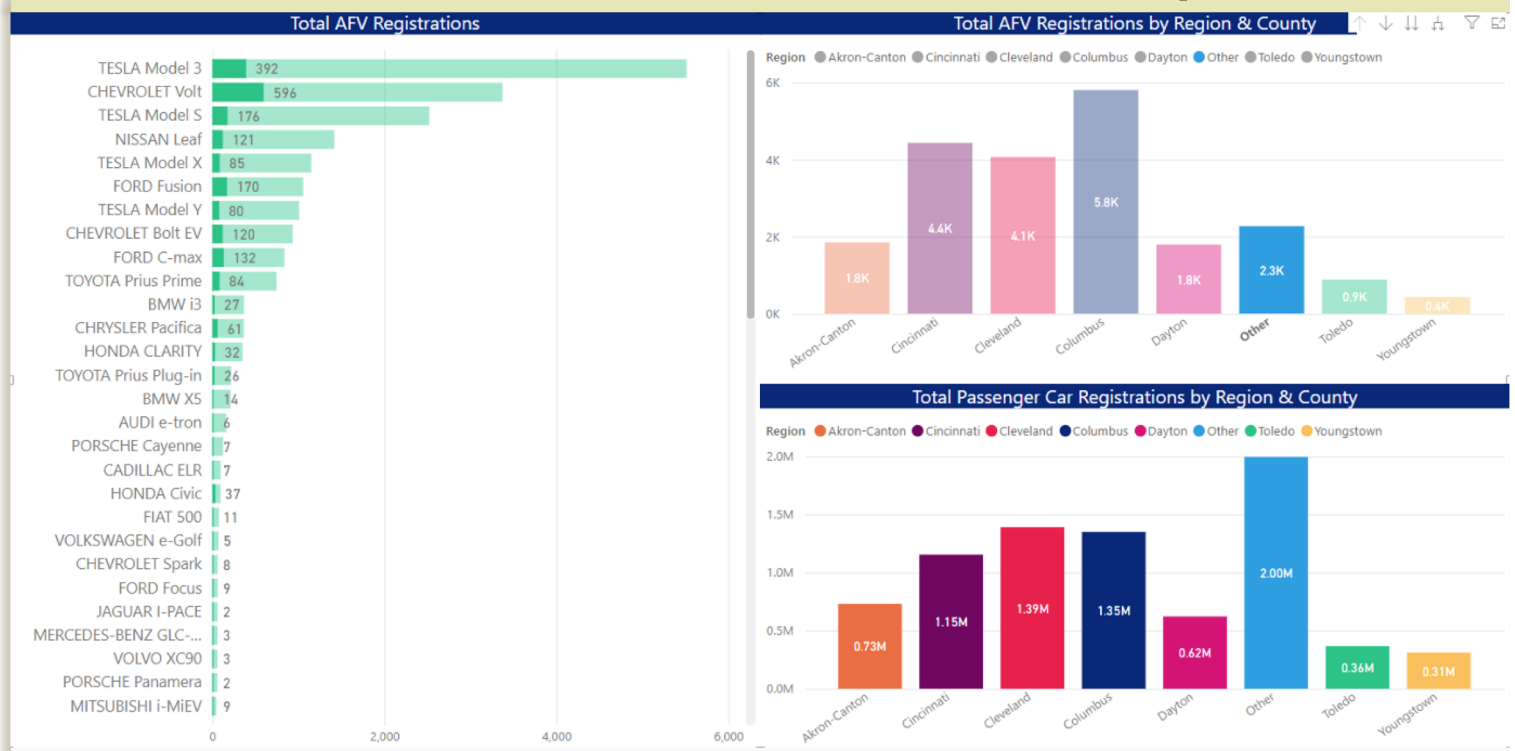
Milestone	Type	Description	Progress
BMV Data Procured	Technical	Bureau of Motor Vehicles (BMV) data procured	Complete
Baseline Data Secured	Technical	Baseline data collected on ICE shuttle bus	Complete
TSP Program Developed	Technical	TSP analysis and education program	Complete
Test Plan Developed	Technical	AV test plan developed	Complete
PAC Meeting Held	Technical	Project Advisory Committee meeting held	Complete
Motorist Data Report Completed	Technical	Individual Motorist final report completed	Report in draft
AV Deployment Initiated	Technical	AV Deployment underway	Iteration 1 of 3 completed
BP1 Go/No-Go	**Go/No-go**	**At least 3 drivers/taxi companies recruited and agree to participate**	**Complete**

FY2022 (BP2/BP3)

Milestone	Type	Description	Progress
EV Shuttle Procured	Technical	Shuttle purchased, delivered, deployed	Vehicle on order
Data Collection Initiated	Technical	Data logger deployment in TSP vehicles	Awaiting units
Draft Playbook Complete	Technical	Playbook draft 1 complete	Pre-draft planning
BP2 Go/No-go	**Go/No-go**	**EV shuttle deployment underway, data collection in progress**	**Incomplete**

Accomplishments

Ohio BMV data collected, Electrification Report drafted



<u>RURAL ELECTRIFICATION</u>: *Challenges and Opportunities – Draft Report*
(Left) Total Alternative Fuel Vehicle (AFV) registrations in Ohio by make and model, with rural and Appalachian county AFV registration totals shaded and enumerated. (Upper Right) Total AFV registrations in Ohio by region and county. (Lower Right) Total passenger car registrations in Ohio by region and county.

EV Shuttle on order

EV Drivetrain Specifications

OEM Platform: Ford E-450

Max GVWR: 14,500 lbs

Battery Technology: BMW i3 Lithium-ion

Battery Capacity: 127 kWh

Range: 105 miles

Peak Motor Power Rating: 190 kW/255 hp

Peak Motor Torque Rating: 1,200 Nm/885 ft-lbs

Gradeability: 17%

Max Speed: 65 mph

Regenerative Braking: Standard

Level 2 AC Charging: 19.2 kW / J1772

50% Charge Time: ~2.5 hours

75% Charge Time: ~4 hours

100% Charge Time: ~8 hours

DC Fast Charging: 60 kW / CCS

Accomplishments

DC Fast Charger Installed

Publicly available DC Fast Charge Station

Use Case: Dedicated charging for Athens Public Transit EV shuttle

Network: Chargepoint

ACT Forum #1 Completed

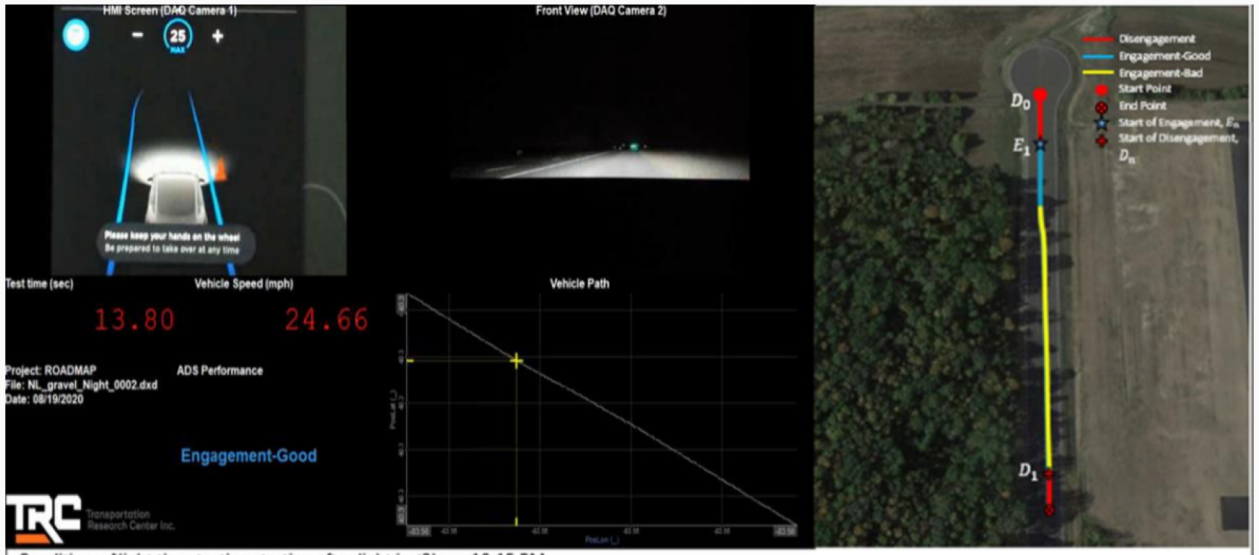
Appalachian Clean Transportation Forum

Nov. 17-18, 2021

During the forum, industry leaders, transportation service providers, policymakers, mobility managers and advocates gathered virtually to discuss innovative rural mobility strategies with transportation experts from around the state and region.

84 Registrants; 16 Presenters

AV Test Plan, Deployment Iteration 1 Completed



Conditions: Night time testing starting after light is <2Lux ~10:15 PM

"Events"	Description
Start of Engagement- E_n	$E_1 \rightarrow Category$ 1, Speed = 25mph.
Engagement Sector – *Good*	For a small stretch (Blue), ADS was able to keep lane on gravel covered lane lines.
Event which impacts ADS Performance	In this case, vehicle was able to engage in the first segment with no gravels on lane lines. If otherwise there is an uncertainty of AP engagement due to gravel covering the lane lines.
Engagement Sector – *Bad*	ADS makes a lane change and drives in the on-coming lane (wrong-way) of a two lane bi-directional road. The ADS continues to perform wrong-way driving, posing a risk to oncoming traffic.
Disengagement – D_n	$D_1 \rightarrow Category3$. The vehicle was traveling in the opposite lane and it shows unsafe behavior. Hence, the safety operator has to take over.

The data insights described above are for one run of a test scenario where the AV performance was evaluated under gravel covered lane lines during nighttime conditions in a controlled environment setting.

Collaboration and Coordination

	Program Management Documents	Individual Motorist Data	EV Shuttle Pilot	TSP Analysis and Education	AV Feasibility Study	Outreach	Project Advisory Committee	Technology Transfer
Rural Action	●	●	●	●	●	●	●	
ODOT/DriveOhio	●	●			●	●		
TRC					●			
Clean Fuels Ohio	●	●		●		●		●
HAPCAP			●				●	
City of Athens			●				●	
Clean Cities Coalitions (WV, VA, PA, KY)							●	
NREL								●

Market Impact and Sustainability

Project Contributions: Understanding the rural mobility landscape using BMV Analysis, AV Route Testing, ACT Forum

Impact: Strategic siting, funding, and installation of EV/AV infrastructure for use by individual motorists, transportation service providers, municipal fleets in rural areas

Insights will be applicable to the broader Appalachian Region and throughout Rural America

Additional demonstration tasks are slated to begin in FY 2021; further demonstration, analysis and report generation take place in FY 2022

Challenge ahead: It is not yet clear whether EV/AV technologies being demonstrated are fully compatible with rural conditions

Final Outputs: Rural Mobility Action Plan, Playbook, Technology Transfer Plan

Summary

Goal

Demonstrate EV/AV mobility service applications in rural environments through qualitative/quantitative approach

- Ohio Bureau of Motor Vehicles EV data collection
- Local fleet analysis, educational activities
- Outreach through ACT Forum, Ride-and-Drive Events

Approach

Pilot a series of demonstrations to understand EV applications in individual motorist, TSP, municipal fleets

- AV Testing and Deployment
- EV Shuttle Purchase and Deployment
- TSP Green Fleet Analyses

Collaborators

Government, industry, research and non-profit partners serving in both technical and stakeholder roles.

Achievements

Resources for Rural Mobility Action Plan

- Rural Electrification Report
- AV Test Plan

Technical Back-Up Divider Slide

Rural Action

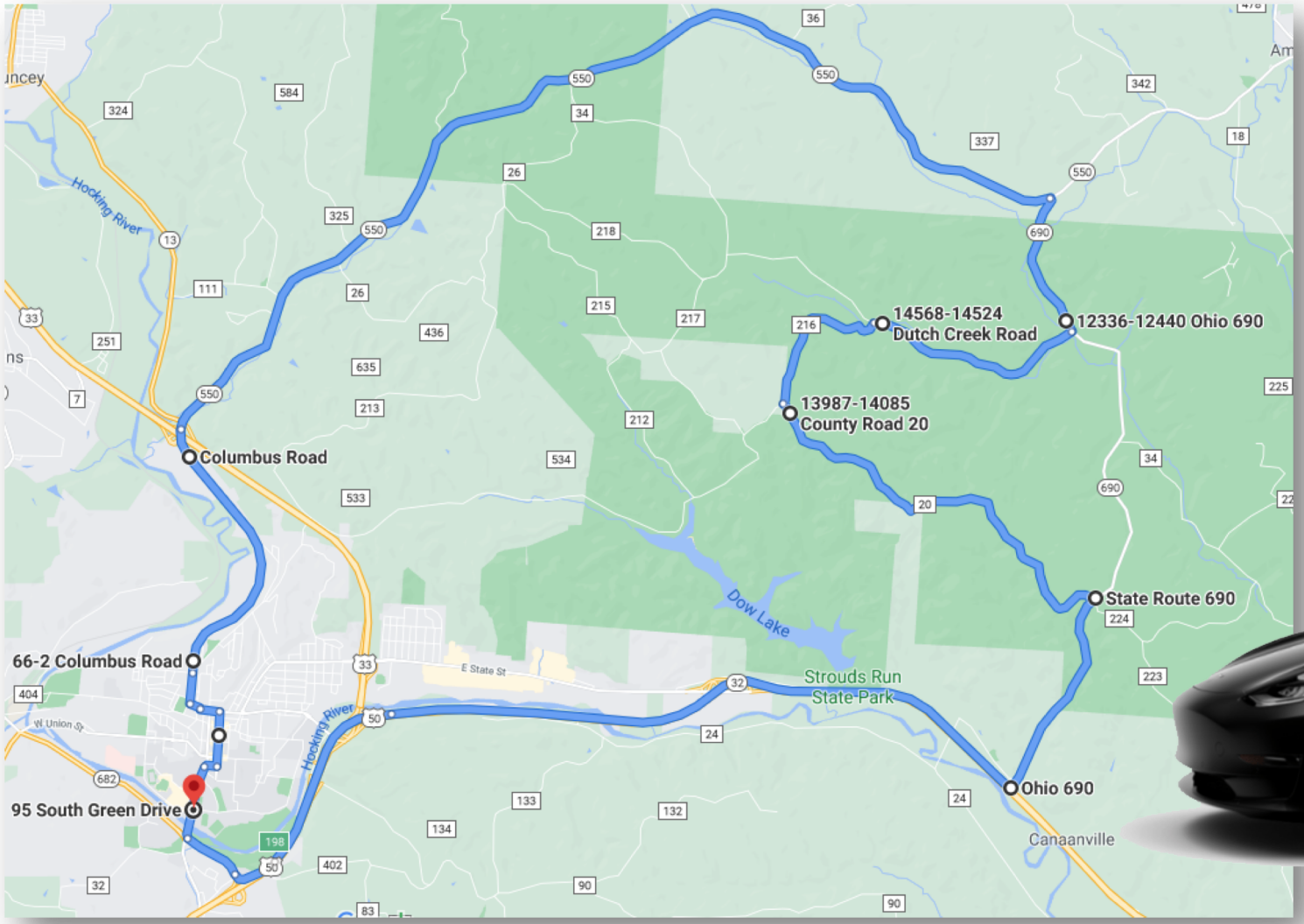
Thriving Communities, Healthy Environments

Nestled in the foothills of Appalachian Ohio, Rural Action was founded in 1991 on the principle that locally-based, sustainable, and inclusive development is the main strategy for building resilient rural Appalachian communities.

Rural Action's mission is to build a more just economy by developing the region's assets in environmentally, socially, and economically sustainable ways. Together, we envision a region with clean streams and healthy forests; a place where thriving family farms, meaningful livelihoods and vibrant communities exist for everyone; with people engaged as good stewards of the world they live in and working together to make this vision a reality.

As a membership-based organization, we believe the best development is done with participation from diverse groups who have a stake in the outcome.

AUTONOMOUS VEHICLE FEASIBILITY STUDY



+ ~28 MILE TEST ROUTE IN ATHENS CO.
+ EXAMINING OBSTACLES IN RURAL INFRASTRUCTURE FOR AUTOMATED VEHICLE TECHNOLOGY
+ FOUR ITERATIONS ON-SITE RURAL ROUTE TESTING, ALL SEASONS
+ CONTROLLED ENVIRONMENT TESTING